

AMENDMENTS TO THE CLAIMS

Complete Listing of the Claims

Claim 1 (Currently Amended): A method for printing and curing ultraviolet (UV) curable ink, comprising the steps of:

printing a particular UV curable ink with a printing head on surfaces of products, articles, or other objects at a printing station;

emitting UV light at a substantially generally constant intensity and at a primary wavelength from ~~arrays of UV light emitting diode (LED) chips~~ staggered rows of UV LED chips mounted adjacent the printing head at a curing station so that the UV LED chips in one row are offset from all the UV LED chips in an adjacent row;

~~moving~~ causing relative movement between the UV LED chips and the printed products, articles, or other objects ~~relative to each other;~~

uniformly applying, distributing or sweeping the UV light emitted from the UV LED chips ~~equally at the same constant intensity on particular~~ so that the UV light uniformly irradiates the surfaces printed with the particular UV curable ink ~~printed on the surfaces of the printed products, articles, or other objects and~~ facing the UV LED chips at the UV curing station while the UV LED chips and printed products, articles, or other objects are moved relative to each other; and simultaneously

curing the particular UV curable ink to produce ~~an identical degree of polymerization on each~~ a cured and printed surface on the UV curable product, article, or other object ~~that is being cured over all the surfaces~~ facing the UV LED chips as the UV light is uniformly applied, distributed, or swept on the particular UV curable ink ~~equally at the same constant intensity~~ with the UV light uniformly irradiating the surfaces being printed and cured.

Claim 2 (Previously Presented): The method of claim 1 wherein the printing head is reciprocated transversely of the products, articles, or other objects together with the UV LED chips.

Claim 3 (Currently Amended): The method of claim 1 including:
~~staggering rows of UV LED chips adjacent the printing head at the curing station so that the UV LED chips in one row are offset from all the UV LED chips in an adjacent row; and~~
conveying or indexing the printed products, articles or other objects past the staggered rows of UV LED chips.

Claim 4 (Currently Amended): The method of claim 1 including emitting at least two different wavelengths of UV light on the particular UV curable ink.

Claim 5 (Currently Amended): The method of claim 1 including ~~reciprocating or oscillating~~ the UV LED chips in proximity to the UV curable ink in an orbital, circular or elliptical path at the curing station.

Claim 6 (Previously Presented): The method of claim 1 including maintaining the intensity and output of the UV light emitted from the UV LED chips generally constant while maintaining the temperature of the UV LED chips generally constant.

Claims 7-9 (Previously Canceled).

Claim 10 (Currently Amended): The method of claim 1 including further emitting fluorescent light upon the particular UV curable ink at the curing station from at least one fluorescent lamp.

Claim 11 (Currently Amended): The method of claim 1 including heating freshly printed particular UV curable ink ~~at the curing station~~ with at least one heat lamp prior to irradiating the particular UV curable ink with UV light.

Claim 12 (Currently Amended): The method of claim 1 including further emitting infra-red light on the particular UV curable ink at the curing station with at least one infra-red heat lamp prior to irradiating the particular UV curable ink with UV light.

Claim 13 (Currently Amended): An ultraviolet (UV) curing apparatus for curing UV curable ink from an ink jet printer or other printer, comprising:

sets staggered rows of UV light-emitting diode (LED) chips positioned adjacent a printing head of an ink jet printer or other printer so that the UV LED chips in one row are offset from all the UV LED chips in an adjacent row for emitting generally constant intensity UV light at a primary wavelength upon a particular UV curable ink dispensed from the printing head upon surfaces of products, articles, or other objects;

a mechanism for causing relative movement between the sets staggered rows of UV LED chips and the printed products, articles or other objects; and

a controller operatively connected to said UV LED chips for controlling and maintaining the intensity of the UV light emitted from the UV LED chips at a substantially generally constant level to uniformly apply and distribute UV light ~~equally at the same intensity on the~~ particular UV curable ink on the surfaces of the products, articles, or other objects facing the UV LED chips to uniformly cure the particular UV curable ink on surface of the product, article or other object facing the UV LED chips ~~so as to produce an identical degree of polymerization of each printed UV curable product, article, or other object that is being cured over all the surfaces facing the UV LED chips.~~

Claim 14 (Previously Presented): The UV curing apparatus of claim 13 wherein said mechanism comprises a reciprocating mechanism for reciprocating the printing head and said sets of UV LED chips together transversely of the products, articles or other objects.

Claim 15 (Previously Canceled).

Claim 16 (Previously Presented): The UV curing apparatus of claim 13 wherein UV LED chips in one row emit UV light at a different wavelength than other UV LED chips in another row.

Claim 17 (Previously Canceled).

Claim 18 (Currently Amended): The UV curing apparatus of claim 13 including:

at least one sensor for sensing the temperature of the UV LED chips; and
said controller is operatively connected to said sensor to maintain the temperature of the UV LED chips generally constant thereby to maintain a uniform, generally constant UV light intensity.

Claims 19-21 (Previously Canceled).

Claim 22 (Currently Amended): The UV curing apparatus of claim 13 including at least one fluorescent lamp operatively connected to the controller and the UV LED chips for emitting fluorescent light on the particular UV curable ink.

Claim 23 (Currently Amended): The UV curing apparatus of claim 13 including at least one heat lamp operatively connected to the controller for heating freshly printed particular UV curable ink prior to irradiating the particular UV curable ink with UV light.

Claim 24 (Currently Amended): The UV curing apparatus of claim 13 including an infra-red lamp operatively connected to the controller for emitting infra-red light on the particular UV curable ink prior to irradiating the particular UV curable ink with UV light.

Claim 25 (New): The method of claim 1 wherein the primary wavelength UV light is 415 nm UV light.

Claim 26 (New): The method of claim 4 wherein the primary wavelength UV light is 415 nm UV light and the other wavelength is around 370 nm UV light.

Claim 27 (New): The method of claim 4 wherein the at least two different wavelengths are emitted from first and second groups of UV LED chips and the first and second groups of UV LED chips are arranged in one of alternate rows of UV LED chips on the panel or interspersed in the staggered rows of UV LED chips on the panel.

Claim 28 (New): The method of claim 1 including further emitting shorter wavelength UV light upon the particular UV curable ink on the surface of the product, article or other object at the curing station from another light source for surface curing the ink.

Claim 29 (New): The method of claim 28 wherein said another light source includes at least one germicidal lamp.

Claim 30 (New): The method of claim 28 wherein said shorter wavelength UV light is 254 nm UV light.

Claim 31 (New): The UV curing apparatus of claim 16 wherein one wavelength UV light is 415 nm UV light and the other wavelength is around 370 nm UV light

Claim 32 (New): The UV curing apparatus of claim 13 wherein another UV light source is mounted at the curing station for emitting a shorter wavelength UV light upon the particular UV curable ink on the surface of the product, article or other object for surface curing the particular UV curable ink.

Claim 33 (New): The UV curing apparatus of claim 32 wherein said another light source includes at least one germicidal lamp.

Claim 34 (New): The UV curing apparatus of claim 32 wherein said shorter wavelength UV light is 254 nm UV light.

Claim 35 (New): The UV curing apparatus of claim 13 wherein:

UV light is emitted at the primary wavelength from a first group of UV LED chips and at a second wavelength different from the primary wavelength from a second group of UV LED chips; and

the first and second groups of UV LED chips are arranged in alternate rows of UV LED chips on the panel or interspersed in the staggered rows of UV LED chips on the panel.

Claim 36 (New): The UV curing apparatus of claim 13 wherein said mechanism is constructed and arranged to move said panel of staggered rows of UV LED chips in a orbital, circular or elliptical path over the products, articles or other objects.